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A taxonomic review of the *Solanum sturtianum* subgroup of subgenus *Leptostemonum* (Solanaceae)

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Abstract

Bean, A.R. A taxonomic review of the *Solanum sturtianum* subgroup of subgenus *Leptostemonum* (Solanaceae). *Nuytsia* 23: 129–161 (2013). The informal taxonomic subgroup typified by *Solanum sturtianum* F.Muell. comprises those species that have stellate hairs, black mature fruits with a thin brittle pericarp, and brown to black seeds. The subgroup is endemic to Australia. Ten species are recognised here: *S. sturtianum* is maintained, *S. morrisonii* Domin is reinstated, and eight new species are described *viz. S. austropiceum* A.R.Bean, *S. elatius* A.R.Bean, *S. iodinum* A.R.Bean, *S. kentrocaule* A.R.Bean, *S. octonum* A.R.Bean, *S. piceum* A.R.Bean, *S. pycnotrichum* A.R.Bean and *S. reclusum* A.R.Bean. A lectotype is chosen for *S. morrisonii*. Descriptions, illustrations and distribution maps are provided for all species.

Introduction

The first specimens of *Solanum sturtianum* F.Muell. were collected by the explorer Charles Sturt and his party while exploring far western New South Wales and adjacent parts of South Australia in 1844 and 1845, and the species was subsequently described by Ferdinand Mueller (Mueller 1854). A second related species, *S. morrisonii* Domin, was added by Domin (1929). This name was a *nomen novum* for the taxon previously named as *S. tetrandrum* var. *angustifolium* Morrison. Australian solanologist David Symon examined many specimens of *S. sturtianum s. lat.* Judging by his determination slips from the 1960s and 1970s, Symon accepted *S. morrisonii* for a time, but ultimately (Symon 1981) he regarded it as a synonym of *S. sturtianum* presumably because of perceived intergradation between it and typical *S. sturtianum*. Symon (*loc. cit.*) adopted a very broad circumscription for *S. sturtianum* in his revision of *Solanum* L. in Australia, but he did concede that *S. sturtianum* 'is much more variable in western and north-western Australia than in its more easterly areas'.

A measure of the variability of *S. sturtianum s. lat.* in Western Australia is that there are numerous specimens for which the collector raised doubts about the identity, mainly by the name provided e.g. *Solanum* sp. aff. *sturtianum*, *Solanum* sp., *Solanum* sp. 1, *Solanum* sp. 'clay plain'. From herbarium specimens received as *S. sturtianum*, the present author has identified ten taxa that are regarded as specifically distinct, including *S. morrisonii*. Eight species, *S. austropiceum* A.R.Bean, *S. elatius* A.R.Bean, *S. iodinum* A.R.Bean, *S. kentrocaule* A.R.Bean, *S. octonum* A.R.Bean, *S. piceum* A.R.Bean, *S. pycnotrichum* A.R.Bean and *S. reclusum* A.R.Bean, are newly named here. These new species are all endemic to Western Australia, and most are of relatively restricted occurrence.

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Solanum sturtianum and its allies belong to the large subgenus *Leptostemonum* (Dunal) Bitter, and can be considered a subgroup of the *S. esuriale* Lindl. group, which was defined by Bean (2004) as having a non-accrescent calyx, glabrous inner surface of the corolla, yellowish green to brown mature fruits, and stellate hairs of the upper leaf surface with 8–18 lateral rays. This definition needs slight modification, because some species described herein have clusters of hairs on the inner surface of the corolla, and all of the species formerly included under *S. sturtianum* have black mature fruits.

The *S. sturtianum* subgroup is readily defined by its fruit type. Mature fruits are always black and have a very thin, brittle pericarp. Furthermore the fruits are 1-locular, with the placenta confined to the central area of the fruit. Unilocular fruits are relatively common amongst the red-fruited *Solanum* species, but have not been recorded for other members of the *S. esuriale* group. Other salient characters are listed below.

Materials and methods

All relevant herbarium material from BRI, CANB and PERTH has been examined, as has a type specimen from MEL. Images of type specimens at E and BM have also been viewed. Some of the relevant taxa have been examined by the author in the field in Queensland and Western Australia. Species are arranged in perceived systematic order, based on their morphological characteristics. The species descriptions and terminology presented in this paper follow those of Bean (2004) and all data gathered during this study have been added to an existing DELTA (Dallwitz *et al.* 1993–) dataset, and interactive keys have been produced using IntKey (Dallwitz *et al.* 2000–; Spooner & Chapman 2007). All measurements are based on dried herbarium material. In the specimen citations, the abbreviation 'HS' is used for Homestead.

The distribution maps were compiled using DIVA-GIS Version 5.4.0.1, using data from the herbaria listed above.

Morphology

Prickles

The density of prickles (Figure 1A) varies greatly between taxa, and is quite variable within taxa. *Solanum kentrocaule* has more than 200 prickles per 0.1 m of stem length on the branchlets, and prickles are also present on the petioles, leaves, rachises and sometimes on the calyx. At the other extreme, *S. morrisonii* often has no prickles at all. The length and shape of the prickles is somewhat diagnostic: *S. elatius* has rather short, broad-based prickles; the prickles of *S. kentrocaule* and *S. austropiceum* are long and slender.

Stellate hairs

Most of the taxa in the *S. sturtianum* subgroup are characterised by stellate hairs (Figure 2A–D) that have 11–16 lateral rays, and three species in the subgroup (*S. morrisonii*, *S. elatius* and *S. sturtianum*) have stellate hairs that lack a central ray. The stellate hairs of several other Australian *Solanum* species can have similarly high numbers of lateral rays (e.g. *S. coactiliferum* J.M.Black and *S. esuriale*), and in some other species the stellate hairs lack a central ray (e.g. *S. corifolium* F.Muell. and *S. dimorphispinum* C.T.White), but the combination is unique to the *S. sturtianum* subgroup.

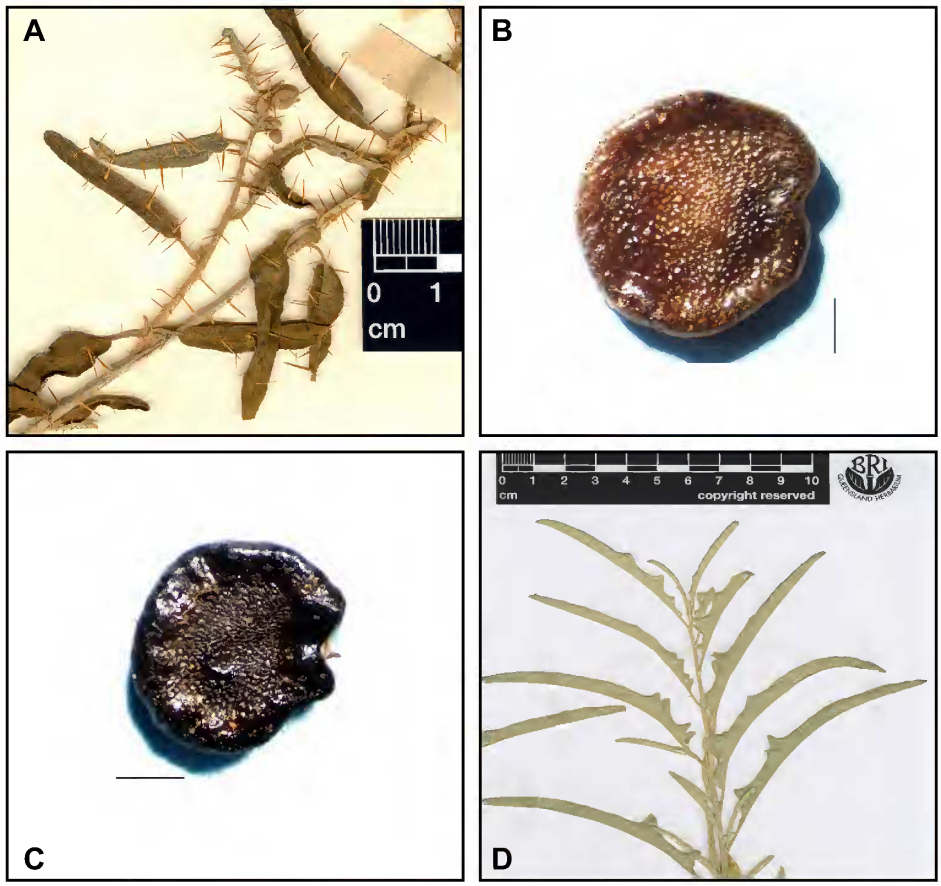

Figure 1. A – adult leaves and prickles of *Solanum piceum* (*C.A. Gardner* 4175); B – seed of *S. elatius* (*A.A. Mitchell* PRP 1239); C – seed of *S. austropiceum* (*T.E. Aplin* 2504); D – juvenile leaves of *S. elatius* (*A.R. Bean* 25314). Scale bars = 1 mm.

Corolla

The corolla for the *S. sturtianum* subgroup is routinely mauve to purple in colour, although white-flowered plants can occur from time to time. The shape is predominantly rotate, but *S. sturtianum* can be shallowly lobed. The inner surface is glabrous for some species, while other species have a cluster of hairs (simple and/or few-branched) at the apex of each corolla lobe.

Calyx

The calyx lobes of the *S. sturtianum* subgroup are short, deltate to semicircular, and not accrescent. Two adjacent lobes may sometimes be partly fused giving rise to an apparently 4-lobed calyx and differing lobe lengths. The calyx is mostly without prickles, but prickles do sometimes occur on the basal flowers of *S. kentrocaule* and *S. piceum*. In two species, the calyx lobes are violet, and there is a marked decrease in density of stellate hairs from the base of the calyx tube to the ends of the lobes; in all other species the calyx is white or yellowish, and the density of hairs is more or less uniform throughout.

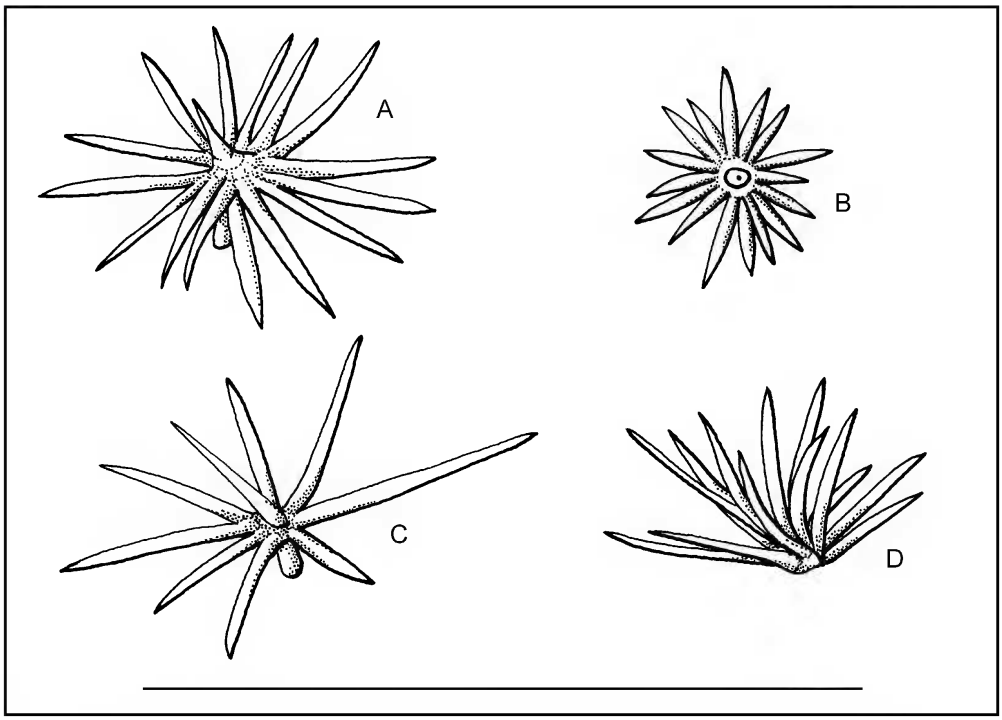

Figure 2. Stellate hairs of the lower leaf surface. A – *Solanum austropiceum*, oblique view (*A.A. Mitchell* 1182); B – *S. elatius*, plan view (*A.R. Bean* 25314); C – *S. pycnotrichum*, oblique view (*S. Dillon & A. Markey* CR 9004); D – *S. reclusum*, lateral view (*R.J. Cranfield* 5640). Scale bar = 1 mm.

Fruits

The *S. sturtianum* subgroup is characterised by the fruits, which are black at maturity and have a thin, crustaceous pericarp. After maturity, the fruits remain attached to the pedicel. They become neither wrinkled nor bony, but tend to retain their globular shape, and then often break into fragments to release the seeds. This is especially evident on the herbarium sheet, where loose seeds, and pieces of placenta and pericarp are the end result; immature fruits remain whole and become lacunose upon drying out.

By contrast, the fruits of arid-zone species with a moderately thick pericarp (e.g. *S. centrale* J.M.Black) shrivel and become wrinkly after maturity; those with a very thick pericarp (e.g. *S. quadriloculatum* F.Muell.) do not shrivel much but become hard and bony.

Seeds

The lenticular seeds (Figure 1B, C) are roughly circular in profile, and brown to black in colour. The surface for all species is alveolate due to the deflation of air-filled, surface-layer cells. Near the margin, the cells often remain inflated and the margin is then smooth and considerably thicker. The seeds are sometimes coated in a resinous material.

Juvenile leaves

In many *Solanum* species, the leaves change in size and shape as the plant matures, and those produced by a young plant before and up to its first inflorescence are called juvenile leaves (Figure 1D). The form of these leaves is often highly diagnostic. Unfortunately, the juvenile leaves are rarely collected or noted by plant collectors, and they are known for only three members of the *S. sturtianum* subgroup, i.e. *S. sturtianum*, *S. morrisonii* and *S. elatius*. The juvenile leaves of the first two species mentioned are entire and of similar shape to the adult leaves, but those of *S. elatius* have two or three pairs of conspicuous obtuse lobes on the basal half of the leaves.

Poisonous properties

As early as 1897 *S. sturtianum* was suspected as being poisonous to cattle. All doubt was removed when, in 1913, more than 1,000 sheep travelling in South Australia died after eating it, and there have been other instances of the death of cattle and sheep in New South Wales and Queensland (Hurst 1942; Everist 1974). The toxic agents in *S. sturtianum* are presumably the steroidal glycoalkaloids that are known to be present. All parts of the plant are regarded as poisonous, with unripe fruits thought to be the most toxic part (McKenzie 2012).

It seems likely that all species in the subgroup are toxic. Aplin and Cannon (1971) reported a strongly positive result for the presence of alkaloids in *S. 'sturtianum'* collected near Onslow, Western Australia. Their voucher specimen (*T.E. Aplin* 1602, PERTH) is identified here as *S. morrisonii*.

Taxonomy

Description of *Solanum sturtianum* subgroup

Erect rhizomatous perennial *shrubs*. *Indumentum* of stellate hairs with lateral rays usually 11–16, central ray absent or present, the rays not gland-tipped; simple hairs absent; small glandular hairs absent from branchlets and leaves, sometimes present on style and ovary. *Adult branchlets* terete, prickles often present. *Adult leaves* entire or repand. *Inflorescence* supra-axillary, cymose (pseudo-racemose), andromonoecious. *Flowers* 5-merous (rarely 4-merous), basal flowers long-styled and bisexual, distal flowers short-styled and effectively male; calyx lobes deltate to semicircular, corolla mauve or purple (occasionally white), rotate; anthers all the same length; functional style not eccentric, protruding between anthers, straight or somewhat sinuate. *Fruiting calyx* not accrescent (less than half length of mature fruit). *Mature fruits* globular, black, dull or shiny, 1-locular (septum absent or incomplete); pericarp very thin and crustaceous, 0.1–0.2 mm thick; placenta sessile, linear; interior dry. *Fruiting pedicels* strongly recurved. *Seeds* brown to black, compressed, lenticular with the surface conspicuously alveolate, but thicker near the rim with a smooth surface.

Size and distribution. Ten species, all endemic to mainland Australia.

Key to species in the *Solanum sturtianum* subgroup

1. Stellate hairs on upper and lower leaf surfaces multiradiate; central ray indistinguishable from lateral rays ..... **1. S. reclusum**

1: Stellate hairs on leaves porrect; central ray absent or present, when present, easily distinguishable from lateral rays

2. Prickles 200–1,000 per 0.1 m length of stem ..... **2. S. kentrocaule**

2: Prickles 0–56 per 0.1 m length of stem

3. Most stellate hairs on leaves with 6–8 (predominantly 8) lateral rays

4. Indumentum of upper leaf surface very sparse; central ray of stellate hairs on leaves 0.1–0.8 times as long as laterals; anthers 5.2–6.5 mm long ..... **3. S. octonum**

4: Indumentum of upper leaf surface dense to very dense; central ray of stellate hairs on leaves 1–2.5 times as long as laterals; anthers 7–7.3 mm long ..... **4. S. pycnotrichum**

3: All stellate hairs on leaves with 10–16 lateral rays

5. Prickles present on at least some leaf laminae on each branch; stellate hairs of calyx with central ray 0.2–1 times as long as laterals; branchlet prickles acicular, (6–)9–18 times longer than wide

6. Lower leaf surface white to grey, with dense to very dense indumentum of stellate hairs; ovary glabrous ..... **5. S. austropiceum**

6: Lower leaf surface green to grey-green, with very sparse to moderate stellate hairs; ovary with glandular hairs and sometimes also with stellate hairs

7. Calyx lobes violet, with stellate indumentum very sparse to sparse, 0.1–0.2 mm diam.; stellate hairs of upper leaf surface with central ray 0.5–0.9 times as long as laterals ..... **6. S. iodinum**

7: Calyx lobes white to pale yellow, with indumentum of stellate hairs very dense, 0.25–0.3 mm diam.; stellate hairs of upper leaf surface with central ray 0–0.4 times as long as laterals ..... **7. S. piceum**

5: Prickles absent from all leaf laminae; stellate hairs on all plant parts lacking a central ray; branchlet prickles broad-based, 4–8 times longer than wide

8. Leaf lamina 3.1–5.7 times longer than broad; branchlet stellate hairs 0.3–0.5 mm diam. ..... **8. S. sturtianum**

8: Leaf lamina 5.7–16 times longer than broad; branchlet stellate hairs 0.15–0.3 mm diam.

9. Upper leaf surface very sparsely to sparsely hairy; style and ovary with small glandular hairs; small shrub 0.3–1 m high; stems usually without prickles; juvenile leaves entire ..... **9. S. morrisonii**

9: Upper leaf surface with moderate to very dense indumentum; style and ovary glabrous; large shrub to 2.5(–3) m high; stems usually sparsely prickly; juvenile leaves with conspicuous lobes (Figure 1D) ..... **10. S. elatius**

1. Solanum reclusum A.R.Bean, *sp. nov.*

Frutex indumento denso usque densissimo in pagina superiore folii; folia pilis multiradiatis stellatis praedita radio centrali longitudine radios laterales aequanti et non distinguibili et calycis indumentum variabile, ad basim tubi densissima usque sparsissima vel absenti ad apicibus loborum.

Typus: north-north-west of Meekatharra, Western Australia [precise locality withheld for conservation reasons], 12 August 1986, *R.J. Cranfield* 5640 (*holo*: PERTH 03699366; *iso*: CANB 380405).

Erect *shrub c.* 1 m high. *Juvenile leaves* unknown. *Adult branchlets* grey or brown, with a dense or very dense indumentum; prickles 5–10 per 0.1 m of stem, straight, broad-based, 1.5–7 mm long, 5–8 times longer than wide, glabrous or with scattered stellate hairs on lower half; stellate hairs 0.25–0.4 mm diam., with a stalk 0–0.1 mm long and 8–12 ascending lateral rays, the central ray indistinguishable from laterals. *Adult leaves* lanceolate, entire; lamina 4.8–7.6 cm long, 1.6–2.2 cm wide, 2.8–4.3 times longer than broad, apex acute, base broadly cuneate, oblique part 0–3 mm long, obliqueness index 0–6 percent; petiole 0.5–0.8 cm long, 8–14% length of lamina, prickles absent or rarely present. *Upper leaf surface* grey, with a dense to very dense indumentum; prickles absent; stellate hairs distributed throughout, 0.05–0.15 mm apart, 0.25–0.5 mm across, with a stalk 0–0.2 mm long and with 8–13 ascending or multiradiate lateral rays, the central ray indistinguishable from laterals. *Lower leaf surface* white, grey or yellowish, with very dense indumentum; prickles absent; stellate hairs *c.* 0.05 mm apart, 0.25–0.5 mm diam., with a stalk 0–0.1 mm long and 8–13 ascending or multiradiate lateral rays, the central ray indistinguishable from laterals. *Inflorescence* 6–11-flowered, with common peduncle 4–10 mm long, rachis prickles absent. *Pedicels* at anthesis 3–5.5 mm long, prickles absent. *Calyx* indumentum very dense at base of tube, gradually becoming sparser towards lobe apices; tube at anthesis 2.5–4.5 mm long; lobes deltate to shortly attenuate, 0.5–1.5 mm long, dark purple; prickles absent; stellate hairs yellowish or rusty, 0.3–0.4 mm across, with a stalk 0–0.1 mm long and 9–13 lateral rays, the central ray indistinguishable from laterals. *Corolla* purple, 12–16 mm long, inner surface glabrous. *Stamens* with anthers 5.1–5.4 mm long; filaments smooth, *c.* 1.7 mm long. *Ovary* with small glandular hairs only; functional style *c.* 9 mm long, with stellate and small glandular hairs. *Fruiting calyx* without prickles. Intact *mature fruits* not seen. *Fruiting pedicels c.* 8 mm long. (Figures 2D, 3)

Specimens examined. Known only from the type collection.

Distribution and habitat. Recorded only from one locality north-north-west of Meekatharra (Figure 4). It was reportedly frequent on a quartz hill in open scrub, with the soil being red clayey sand.

Phenology. Flowers are recorded for August. Fruiting time is unknown.

Conservation status. To be listed as Priority One under Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora (M. Smith pers. comm.).

Etymology. From the Latin *reclusus* meaning 'separated', 'removed' or 'secluded'. This is in reference to the geographical location of the type, remote from any major highway or town.

Affinities. The closest relative of *S. reclusum* is unknown. It differs from all other species of the *S. sturtianum* subgroup by the multiradiate stellate hairs of the leaves, where the central ray is indistinguishable from the lateral rays (Figure 2D). The indumentum of the upper leaf surface is dense to very dense, a feature shared with only *S. elatius*, *S. sturtianum* and *S. pycnotrichum*. The calyx

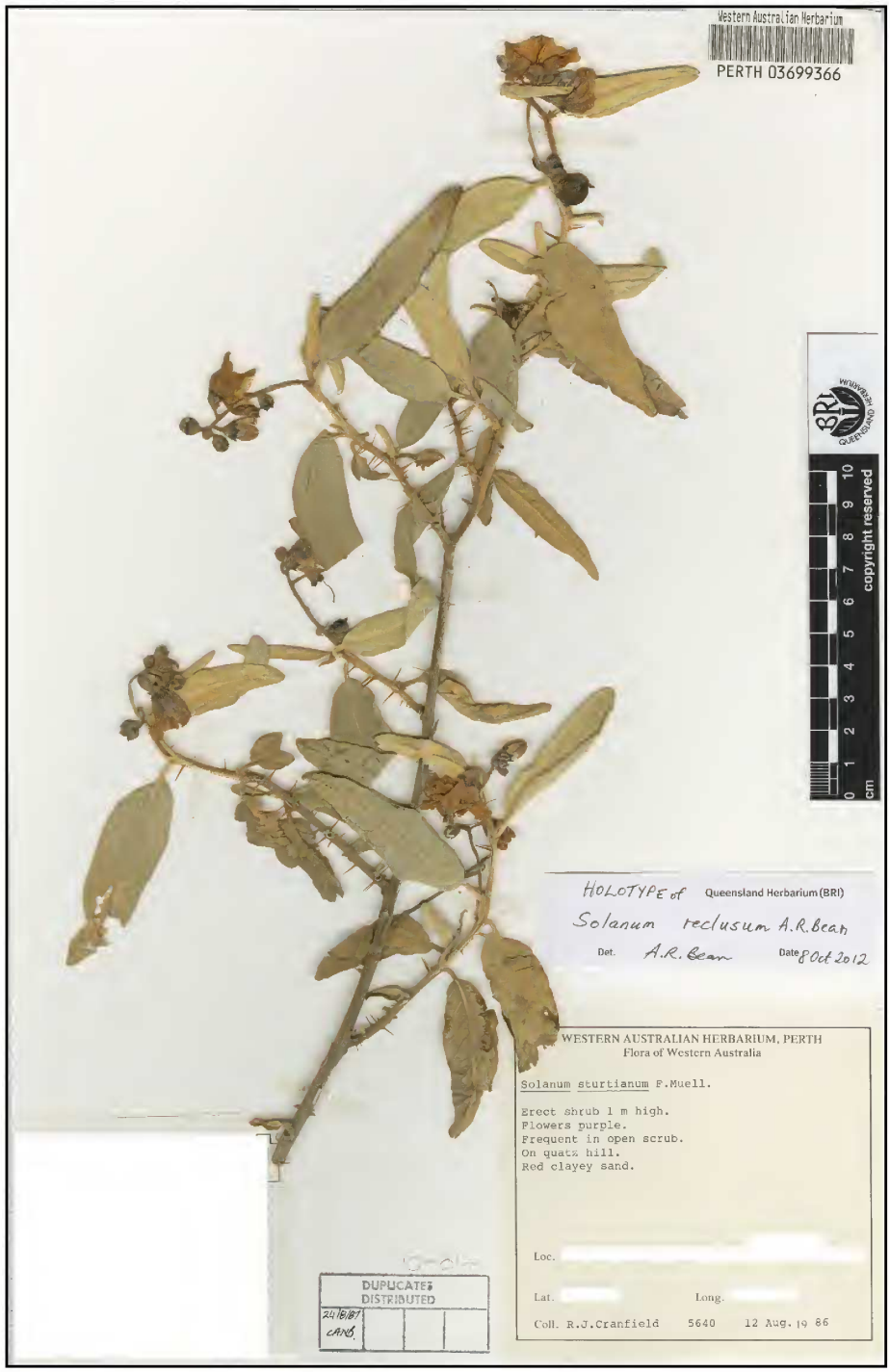

Figure 3. Holotype of *Solanum reclusum* (*R.J. Cranfield* 5640).

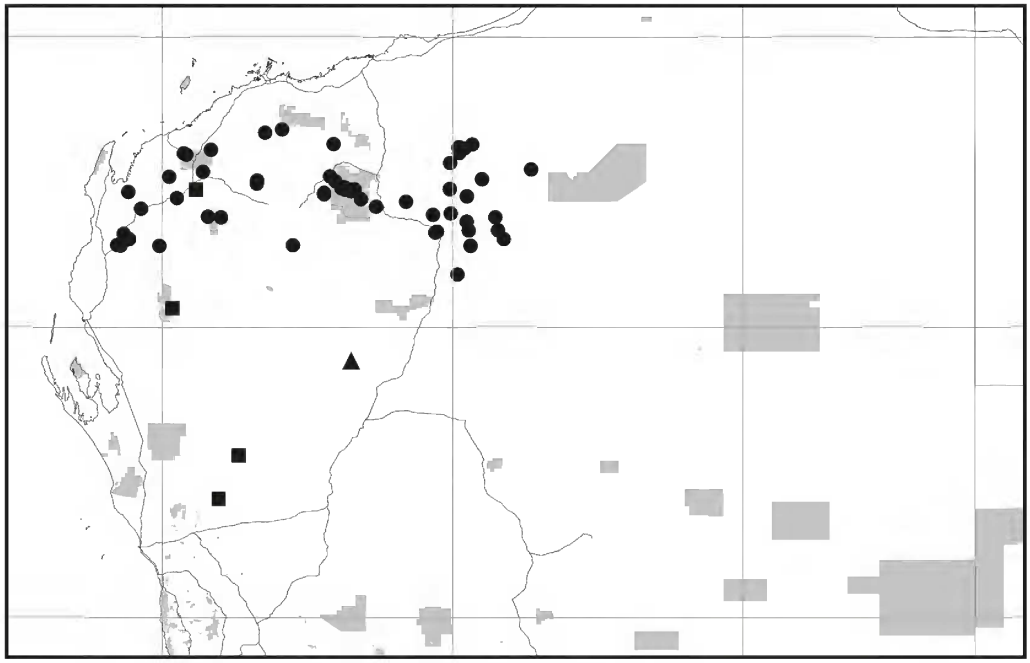

Figure 4. Distribution of *Solanum elatius* (●), *S. pycnotrichum* (■) and *S. reclusum* (▲).

indumentum varies from very dense at the base of the tube to very sparse or absent at the lobe apices; this feature occurs in only one other species in the subgroup, *S. iodinum*.

2. Solanum kentrocaule A.R.Bean, *sp. nov.*

Affinis *S. piceo* A.R.Bean sed caulibus aculeos in numero multo majore ferentibus, aculeis in pagina foliorum secus mesonervum et venam secundariam distributis, indumento sparso usque denso in pagina superiore foliorum, praesentia aculeorum superficie rhachis, inflorescentia 8–17-flora et seminibus minoribus absque margine tumido differens.

Typus: Tom Price, Western Australia [precise locality withheld for conservation reasons], 23 September 2006, *D. Halford* Q9247 (*holo*: BRI AQ742630; *iso*: PERTH, *distribuendi*).

Solanum sp. Gurinbiddy Range (M.E. Trudgen & M. Trudgen MET 12775), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed 30 September 2012].

Shrub 0.5–1.5 m high. *Juvenile leaves* unknown. *Adult branchlets* terete or ridged, white to yellow-brown, with a dense or very dense indumentum; prickles 200–1,000 per 0.1 m of stem, straight, acicular, 1.5–12 mm long, 9–18 times longer than wide, glabrous; stellate hairs 0.25–0.4 mm diam., with a stalk 0–0.1 mm long and 8–16 porrect or ascending lateral rays, the central ray 0.2–0.6 times as long as laterals. *Adult leaves* narrow lanceolate or lanceolate, entire or shallowly lobed throughout, lobes 3–5 on each side, obtuse, lobing index 1–1.1; lamina 3.5–12.5 cm long, 0.9–2 cm wide, 3.7–6.5 times longer than broad, apex acute, base cuneate or obtuse, oblique part 0–4 mm long, obliqueness index 0–6%; petiole 0.6–2.2 cm long, 14–22% length of lamina, prickles present. *Upper leaf surface* green or grey-green, with a sparse to dense indumentum; prickles present on midvein and lateral veins,

10–60, straight, acicular, 1.5–9 mm long; stellate hairs distributed throughout, 0.15–0.4 mm apart, 0.15–0.3 mm across, sessile, with 8–13 porrect lateral rays, the central ray 0.2–0.4 times as long as laterals. *Lower leaf surface* white or grey, with a moderate to very dense indumentum; prickles 40–70, present on midvein and lateral veins, straight, acicular; stellate hairs 0.1–0.3 mm apart, 0.2–0.4 mm diam., sessile, with 8–13 porrect lateral rays, the central ray 0.2–0.5 times as long as laterals. *Inflorescence* 8–17-flowered, with common peduncle 4–11 mm long, rachis prickles present. *Pedicels* at anthesis 2.5–9 mm long, prickles absent or present. *Calyx* with a very dense indumentum; tube at anthesis 2–3.5 mm long; lobes deltate, 1–3 mm long; prickles absent or rarely up to 5, 1–2.5 mm long; stellate hairs yellow, white or purple, 0.2–0.25 mm across, with a stalk 0–0.05 mm long and with 8–12 lateral rays, the central ray 0.4–0.7 times as long as laterals. *Corolla* mauve or purple, 13–17 mm long, inner surface glabrous throughout. *Stamens* with anthers 5–7.5 mm long; filaments smooth, 0.8–1.8 mm long. *Ovary* with small glandular hairs only; functional style 7–12 mm long, with small glandular hairs only. *Fruiting calyx* lobes around half length of mature fruit, prickles absent or present. *Mature fruits* 1–4 per inflorescence, *c.* 13 mm diam. Fruiting pedicels 6–9 mm long. *Seeds* 2.5–3 mm long; surface alveolate throughout, without a smooth swollen rim. (Figures 5, 6A, B)

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 31 July 1980, *K. Atkins* 801 (PERTH); 7 Aug. 1995, *B. Backhouse* SR337 (PERTH); 14 Oct. 1968, *J.V. Blockley* 998 (PERTH); 5 Aug. 2008, *G. Byrne* 3533 (DNA, PERTH); 2 Sep. 2004, *R.J. Chinnock* 9698 (PERTH); 18 July 2007, *T. Edwards* AJ16-27 (PERTH); 2 Sep. 2004, *W.K. Harris* WKH2242 (BRI); 31 July 1986, *S.D. Hopper* 4984 (PERTH); 7 Aug. 1998, *S. van Leeuwen* 3710 (CANB, PERTH); 7 Aug. 1998, *S. van Leeuwen* 3744 (CANB, PERTH); 9 Sep. 1984, *P.A. Wurm* 1517 (PERTH).

Distribution and habitat. Solanum kentrocaule is endemic to Western Australia and has been found only in the Hamersley Range between 700 metres to 1,250 metres altitude (Figure 7). It inhabits hillsides and mountaintops, or occasionally creek-beds, in skeletal red-brown soil over ironstone or on basalt scree. Associated tree species include *Eucalyptus leucophloia* and *E. kingsmillii*.

Phenology. Flowers are recorded from July to October; fruits are recorded for September.

Conservation status. Recently listed as Priority Three under DEC Conservation Codes for Western Australian Flora, as *S.* sp. Gurinbiddy Range (M.E. Trudgen & M. Trudgen MET 12775) (Western Australian Herbarium 1998–).

Etymology. From the Greek *kentron* meaning 'point', 'prickle' or 'goad', and *caulos* meaning 'stem'. This is in reference to the extremely prickly stems of this species.

Affinities. *Solanum kentrocaule* appears to be most closely related to *S. piceum*, but it differs from the latter by the far greater number of prickles on the branchlets, the greater number of prickles (10–60) on the upper leaf surface, the greater number of flowers per inflorescence, and by the seeds only 2.5–3 mm long and lacking a smooth swollen rim. *Solanum kentrocaule* can be distinguished from all other species of the *S. sturtianum* subgroup by the very prickly branchlet, with 200–1,000 prickles per decimetre.

Notes. The specimen from Capricorn Range (*J.V. Blockley* 998) is atypical because of the sparse indumentum on the leaves. It is somewhat disjunct from the main distribution of the species, and may represent a distinct taxon.

Figure 5. Holotype of *Solanum kentrocaule* (*D. Halford* Q 9247).

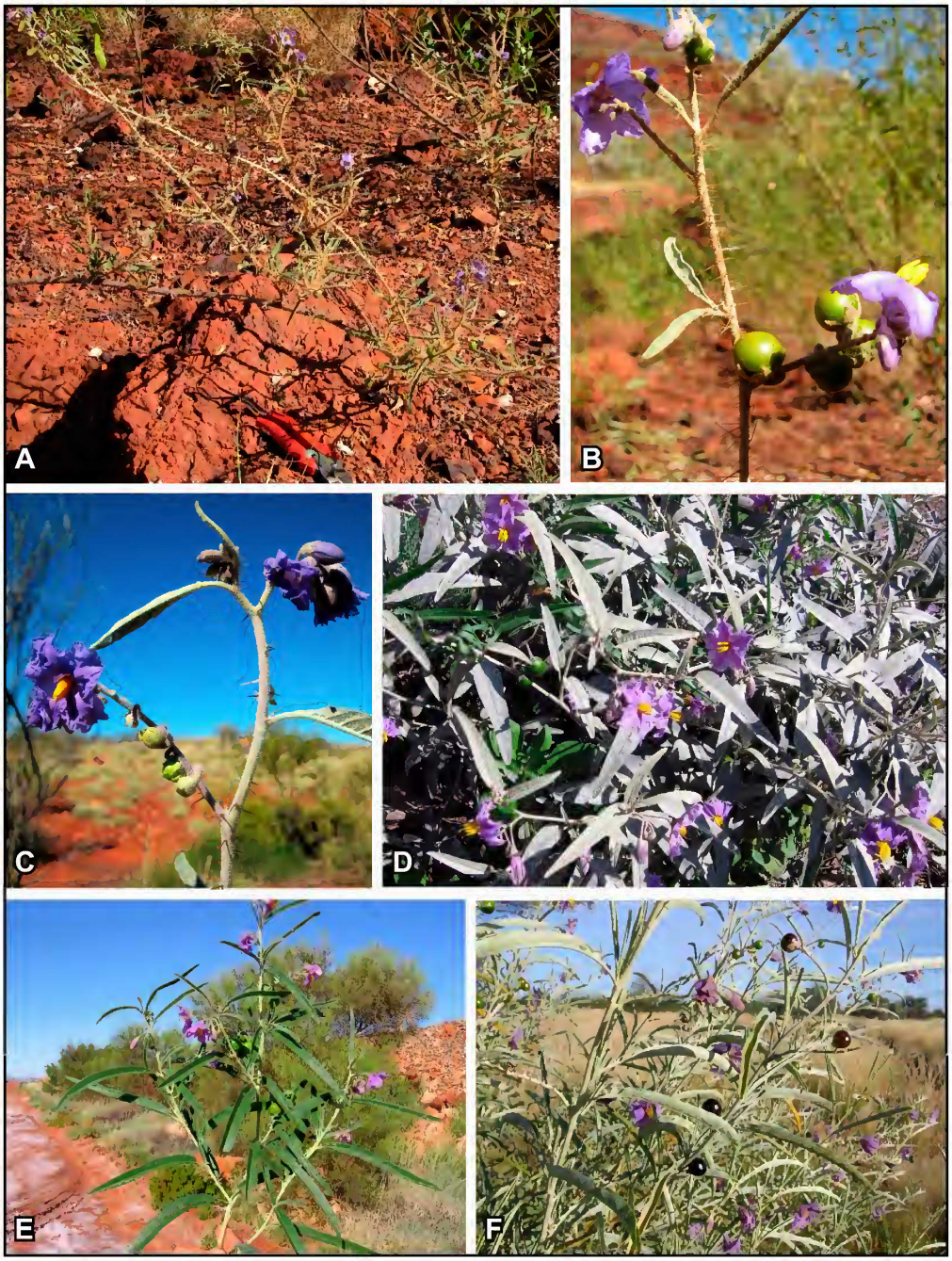

Figure 6. Flowering and fruiting plants in habitat. A – *Solanum kentrocaule*, whole plant (*D. Halford* Q 9247); B – *S. kentrocaule*, branch with flowers and immature fruits (*D. Halford* Q 9247); C – *S. pycnotrichum*, branch with flowers and immature fruits (*S. Dillon & A. Markey* CR 9004); D – *S. sturtianum*, portion of plant with flowers and immature fruits (*A.R. Bean* 30118); E – *S. morrisonii*, branch with flowers and immature fruits (*A.R. Bean* 25435); F – *S. elatius*, branches with flowers, immature and mature fruits (*A.R. Bean* 25314).

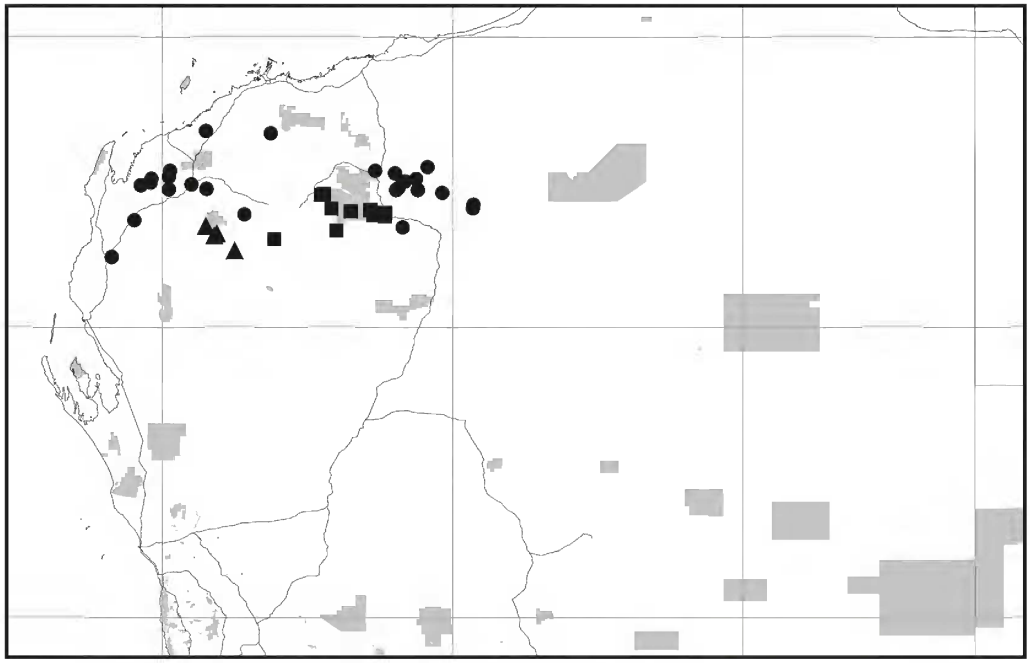

Figure 7. Distribution of *Solanum kentrocaule* (■), *S. morrisonii* (●) and *S. octonum* (▲).

3. Solanum octonum A.R.Bean, *sp. nov.*

Affinis *S. morrisonii* Domin sed numero majore aculeorum in quaque monade areae, in paginis foliorum pilis majoribus stellatis cum multis radiis 8 lateralibus praeditis, pilis stellatis calycis radium centralem distinctum ferentibus et pedicellis brevioribus differens.

Typus: Barlee Range, Western Australia [precise locality withheld for conservation reasons], 18 August 1961, *R.D. Royce* 6559 (*holo*: PERTH 03753107).

Erect *shrub* 0.8–1.5 m high. *Juvenile leaves* unknown. *Adult branchlets* white to grey, with a very dense indumentum; prickles 10–56 per 0.1 m of stem, straight or curved, broad-based or acicular, 4–7 mm long, 5–12 times longer than wide, with scattered stellate hairs on lower half; stellate hairs 0.3–0.5 mm diam., with a stalk 0–0.1 mm long and with 8–15 porrect or ascending lateral rays, the central ray 0.2–0.8 times length of laterals. *Adult leaves* lanceolate, entire; lamina 5.9–8.0 cm long, 0.8–1.7 cm wide, 3.9–8 times longer than broad, apex obtuse, base cuneate, oblique part 0–7 mm long, obliqueness index 0–10%; petiole 0.5–1.6 cm long, 8–25% length of lamina, prickles present or absent. *Upper leaf surface* green, with a very sparse indumentum; prickles absent or present, 0–3 on midrib; stellate hairs distributed throughout, 0.4–0.6 mm apart, 0.2–0.4 mm across, sessile, with 6–12 porrect lateral rays, the central ray 0.1–0.8 times as long as laterals. *Lower leaf surface* green, with a sparse to dense indumentum; prickles absent or present, 0–1 on midrib; stellate hairs 0.15–0.4 mm apart, 0.25–0.5 mm diam., sessile, with 7–11 porrect lateral rays, the central ray 0.1–0.5 times as long as laterals. *Inflorescence* 6–13-flowered, with common peduncle 1–10 mm long, rachis prickles present or absent. *Pedicels* at anthesis 6–9 mm long, prickles absent. *Calyx* with a dense to very dense indumentum; tube at anthesis 2.5–3 mm long; lobes deltate, 2–3 mm long; prickles absent; stellate hairs

white or yellowish, 0.25–0.35 mm across, with a stalk 0–0.1 mm long and with 6–13 lateral rays, the central ray 0.5–1 times as long as laterals. *Corolla* purple, 12–15 mm long, inner surface glabrous or with a cluster of simple and branched hairs near lobe apices. *Stamens* with anthers 5.2–6.5 mm long; filaments smooth, 1.3–1.6 mm long. *Ovary* with small glandular hairs; functional style 8–9.5 mm long, with small glandular hairs. *Fruiting calyx* lobes less than half length of mature fruit, prickles absent. *Mature fruits* 1–4 per inflorescence, diam. unknown. *Fruiting pedicels c.* 8 mm long. *Seeds* not seen. (Figure 8)

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: Sep. 1959, *A. Robinson s.n.* (PERTH); 5 Aug. 1993, *S. van Leeuwen* 1391 (PERTH); 12 June 1994, *S. van Leeuwen* 1714 (PERTH).

Distribution and habitat. Apparently restricted to the Barlee Range, in the Gascoyne bioregion of Western Australia (Figure 7). It is variously recorded from a gorge top, red sandy soil with *Triodia*, a steep hillslope with skeletal soil, and a riverine area with gritty sand.

Phenology. Flowers are recorded from June to September; mature fruits unknown.

Conservation status. To be listed as Priority Two under DEC Conservation Codes for Western Australian Flora (M. Smith pers. comm.).

Etymology. From the Latin *octonus*, 'consisting of eight'. This refers to the stellate hairs of the leaves that are predominantly 8-rayed, in contrast to most species of the *S. sturtianum* subgroup.

Affinities. *Solanum octonum* is similar in appearance to *S. morrisonii*, but differs from the latter by the larger stellate hairs on all plant parts, and by the stellate hairs having a distinct central ray and fewer lateral rays (typically eight). It differs from *S. pycnotrichum*, the other species having stellate hairs with ± eight lateral rays, by its much sparser indumentum, shorter central ray on the stellate hairs, and shorter anthers.

4. Solanum pycnotrichum A.R.Bean, *sp. nov.*

A *S. sturtiano* F.Muell. pilis majoribus stellatis in partibus totis plantae, pilis radiis centralibus 6–8 et radio centrali longo praeditis, antheris longioribus et numero majore florum in inflorescentia differens.

Typus: south-south-east of Onslow, Western Australia [precise locality withheld for conservation reasons], 27 June 2011, *S. Dillon & A. Markey* CR 9004 (*holo*: BRI AQ875862; *iso*: PERTH 08338361).

Erect *shrub* 1.1–1.8 m high. *Juvenile leaves* unknown. *Adult branchlets* white to pale yellow, with a very dense indumentum; prickles 10–32 per 0.1 m of stem, straight, broad-based or acicular, 2–10 mm long, 7–14 times longer than wide, glabrous or with scattered stellate hairs on lower half; stellate hairs 0.5–0.7 mm diam., with a stalk 0–0.4 mm long and with 8 ascending lateral rays, the central ray 1–2.2 times length of laterals. *Adult leaves* lanceolate to narrowly ovate, entire or repand; lamina 4.8–9.0 cm long, 1.6–3.4 cm wide, 2.6–4.5 times longer than broad, apex acute or obtuse, base obtuse or cuneate, oblique part 0–2 mm long, obliqueness index 0–3%; petiole 0.5–0.9 cm long, 6–18% length of lamina, prickles absent. *Upper leaf surface* grey-green to grey, with a dense to very dense indumentum; prickles absent; stellate hairs distributed throughout, 0.05–0.2 mm apart, 0.35–0.6 mm

Figure 8. Holotype of *Solanum octonum* (*R.D. Royce* 6559).

across, sessile, with 6–8 porrect lateral rays, the central ray 1–2.5 times as long as laterals. *Lower leaf surface* white or grey, with a dense to very dense indumentum; prickles absent; stellate hairs 0.05–0.1 mm apart, 0.4–0.6 mm diam., with a stalk 0–0.2 mm long and with 6–8 porrect lateral rays, the central ray 1–2 times as long as laterals. *Inflorescence* 8–29-flowered, with common peduncle 5–18 mm long, rachis prickles present or absent. *Pedicels* at anthesis 5–6 mm long, prickles absent. *Calyx* with a dense to very dense indumentum; tube at anthesis 2–3 mm long; lobes deltate, 1.5–2.5 mm long; prickles absent; stellate hairs yellowish, 0.3–0.5 mm across, with a stalk 0–0.1 mm long and 8 lateral rays, the central ray 1.2–2 times as long as laterals. *Corolla* purple, *c.* 13 mm long, inner surface glabrous or with cluster of simple hairs near lobe apices. *Stamens* with anthers 7.0–7.3 mm long; filaments smooth, *c.* 1.7 mm long. *Ovary* with small glandular hairs; functional style *c.* 10.5 mm long, with small glandular hairs. *Fruiting calyx* lobes less than half length of mature fruit, prickles absent. *Mature fruits* 2–4 per inflorescence, *c.* 15 mm diam. *Fruiting pedicels* 9–12 mm long. *Seeds* 3.2–3.4 mm long; surface alveolate throughout, without a smooth swollen rim. (Figures 2C, 6C, 9)

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 23 Aug. 1931, *C.A. Gardner & W.E. Blackall* 512 (PERTH); 27 Aug. 2008, *R. Meissner & J. Wright* 2083 (PERTH); 19 Aug. 1987, *K. Newbey* 11610 (PERTH).

Distribution and habitat. The species has a scattered occurrence near the west coast of Western Australia, from Cane River Conservation Park in the north, to Mullewa in the south (Figure 4). On rocky sites, often drainage lines, with siltstone or banded ironstone in shrubland. Various *Acacia* spp. are dominant, also present in some places are *Solanum lasiophyllum*, *Eremophila latrobei* and *Ptilotus obovatus*.

Phenology. Flowers and fruits have been recorded in June and August.

Conservation status. To be listed as Priority Two under DEC Conservation Codes for Western Australian Flora (M. Smith pers. comm.).

Etymology. From the Greek *pyknos* meaning 'thick' or 'dense', and *trichos* meaning 'hair'. The leaves of this species have very dense and thick stellate hairs.

Affinities. *Solanum pycnotrichum* has no obvious close affinity with others in the subgroup. It is the only species having stellate hairs in which the central ray consistently exceeds the lateral rays in length. The lateral rays number 6–8, and of the other subgroup members, only *S. octonum* has so few. Its short petioles are also a notable feature, as is the long rachis with many flowers.

5. Solanum austropiceum A.R.Bean, *sp. nov.*

Affinis *S. piceo* A.R.Bean sed aculeis minus frequentibus in pagina folii, absentia loborum in foliis adultis, indumento moderate denso usque densissimo in pagina inferiore folii, calycis pilis stellatis radio centrali radiis lateralibus 0.3–1 longiore praeditis et ovario glabro differens.

Typus: 39 miles south of Old Mundiwindi, Western Australia, 22 August 1960, *A.S. George* 958 (*holo*: BRI AQ875922; *iso*: PERTH 03699285).

Erect *shrub* 0.4–1.2 m high. *Juvenile leaves* unknown. *Adult branchlets* white or grey, with a very dense indumentum; prickles present, 6–22 per 0.1 m of stem, straight, acicular, 3–9 mm long, 10–15 times longer than wide, glabrous or with scattered stellate hairs on lower half; stellate hairs 0.4–0.6 mm

Figure 9. Holotype of *Solanum pycnotrichum* (*S. Dillon & A. Markey* CR 9004).

diam., sessile, with 12–16 porrect lateral rays, the central ray 0.1–0.6 times as long as laterals. *Adult leaves* lanceolate or elliptical, entire; lamina 3.5–8.0 cm long, 0.8–1.5 cm wide, 4.1–6.1 times longer than broad, apex obtuse or acute, base cuneate or obtuse; oblique part 0–8 mm long, obliqueness index 0–14%; petiole 0.5–2.1 cm long, 11–37% length of lamina, prickles absent or present. *Upper leaf surface* green to grey-green, with indumentum absent, or very sparse to sparse; prickles absent or present on midrib; stellate hairs 0.3–2.0 mm apart, 0.25–0.4 mm across, sessile, with 11–16 porrect lateral rays, the central ray 0.1–0.4 times as long as laterals. *Lower leaf surface* white or grey, with a moderate to very dense indumentum; prickles absent or present on midrib; stellate hairs 0.05–0.3 mm apart, (0.25–)0.3–0.6 mm diam., sessile, with 11–16 porrect lateral rays, the central ray 0.1–0.7 times as long as laterals. *Inflorescence* 4–11-flowered, with common peduncle 0–4 mm long, rachis prickles absent. *Pedicels* at anthesis 5–10 mm long, prickles absent. *Calyx* with a dense to very dense indumentum; tube at anthesis 1.5–2.5 mm long; lobes 2.0–3.0 mm long; prickles absent; stellate hairs yellow or white, 0.25–0.35 mm across, sessile, with 8–16 lateral rays, the central ray 0.3–1 times as long as laterals. *Corolla* purple, 10–15 mm long, inner surface glabrous. *Stamens* with anthers 3.8–6.0 mm long; filaments papillose, *c.* 1.5 mm long. *Ovary* glabrous; functional style 8–9 mm long, glabrous or with short glandular hairs and stellate hairs. *Mature fruits* 1 or 2 per inflorescence, 11–15 mm diam., black, shiny. *Fruiting pedicels* 7–11 mm long. *Seeds* 3.5–4.2 mm long. (Figures 1C, 2A, 10)

Selected specimens examined. WESTERN AUSTRALIA: Pollele Station, 1 Apr. 1962, *Anon.* (PERTH); 6 miles S of Moorarie HS on road to Meekatharra, 24 Aug. 1963, *T.E. Aplin* 2504 (PERTH); Wongawol Station, July 1941, *F.M. Bennett* 116 (PERTH); Glenorn Station near Morgans, 19 Aug. 1938, *N.T. Burbidge* 195 (PERTH); Patience Well area, Gibson Desert, 5 May 2001, *C.P. Campbell* 1961 (PERTH); Moorarie Station, via Meekatharra, 25 Aug. 1963, *J.R. Cannon* JRC 630818 (PERTH); 4.8 km SSE of Winderabbe Well, 4.8 km W of Erraninnie Well, Beringarra Station, 22 Apr. 1986, *R.J. Cranfield* 5304 (PERTH); Muthawyne Well, Moorarie Station, 25 Aug. 1986, *R.J. Cranfield* 5912 (PERTH); Corymbia camp, near Yallum Well on Carnegie Station, 23 Apr. 2002, *D.J. Edinger et al.* DJE 3160 (PERTH); 114.4 miles from Carnegie Station towards Mt Everard, 27 July 1966, *A.R. Fairall* 2030 (PERTH); Mt Margaret, 11 Aug. 1931, *C.A. Gardner & W.E. Blackall* 431 (PERTH); 28 miles [45 km] N of Warburton Mission, 24 July 1963, *A.S. George* 5308 (PERTH); Belele Station, 56 km WNW of Meekatharra, 20 Aug. 1965, *D.W. Goodall* 3027 (PERTH); Giles, 580 km WSW of Alice Springs, 8 July 1958, *R. Hill & T.R. Lothian* 889 (PERTH); 17 km N of Serpents Glen, Carnarvon Range, Little Sandy Desert, 5 Aug. 2001, *K.F. Kenneally & D.J. Edinger* 12201 (PERTH); 20 km W of Three Rivers HS, 20 Dec. 1983, *A.A. Mitchell* 1182 (PERTH); Pollele Station, 4 Apr. 1987, *A.L. Payne* 308 (PERTH); Mt Morgan mine, 23 July 1988, *H. Pringle* 2064 (PERTH); 2.2 km W of 7978, Lights of London paddock, Mount Weld Station, 22 July 1989, *H. Pringle* 2459 (PERTH); Lake Carey, *c.* 1 km NW from Mt Margaret trig on track to edge of lake, 15 Mar. 2004, *L.S. Sweedman* 6365 (PERTH).

Distribution and habitat. Solanum austropiceum is, on current knowledge, endemic to Western Australia, extending from Mt Augustus in the west to Giles in the east, and from Newman in the north to as far south as Leonora (Figure 11). It is often associated with Mulga (*Acacia aneura*) communities on plains, low hills or creekbanks, while the soil varies from red clayey loam to sand or laterite.

Phenology. Flowers are recorded from March to August; fruits are recorded from April to December.

Conservation status. A common species with a wide distribution, including occurrences in National Parks or conservation reserves.

Etymology. The epithet alludes to the fact that this species has a more southerly distribution than the related *S. piceum*; from the Latin *austro-* meaning 'southern'.

Figure 10. Isotype of *Solanum austropiceum* (*A.S. George* 958).

Affinities. *Solanum austropiceum* is clearly related to *S. piceum*, but it differs from the latter by the strongly discolorous leaves (lower surface with moderately dense to very dense indumentum), prickles borne on only some of the leaves of a given branch, the glabrous ovary, and the often greater relative length of the central ray of the stellate hairs. *Solanum austropiceum* has consistently entire leaves, whereas *S. piceum* frequently has shallow irregular lobes, and sometimes hastate bases.

6. Solanum iodinum A.R.Bean, *sp. nov.*

Affinis *S. piceo* A.R.Bean sed pilis stellatis in pagina superiore folii radio centrali radiis lateralibus 0.5–0.9 longiore praeditis, calycis lobis violaceis ferentibus indumentum sparsissimum usque sparsum pilorum stellatorum, calycis pilis stellatis minoribus et pedicellis saepe longioribus differens.

Typus: Mount Padbury Station, Western Australia [precise locality withheld for conservation reasons], 15 August 1986, *R.J. Cranfield* 5709 (*holo*: PERTH 03699455; *iso*: CANB 380509).

Erect *shrub c.* 0.5 m high. *Juvenile leaves* unknown. *Adult branchlets* brown to violet, with a very dense indumentum; prickles present, 3–10 per 0.1 m of stem, straight, acicular, 4.5–8 mm long, 9–11 times longer than wide, glabrous or with stellate hairs at base; stellate hairs 0.35–0.5 mm diam., stalks absent, with 11–16 porrect lateral rays, the central ray 0.4–0.6 times as long as laterals. *Adult leaves* lanceolate or elliptical, entire; lamina 2.0–5.7 cm long, 0.6–1.3 cm wide, 2.6–4.4 times longer than broad, apex obtuse, base cuneate or obtuse; oblique part 0–1.5 mm long, obliqueness index 0–4%; petiole 0.4–1.0 cm long, 17–23% length of lamina, prickles absent or present. *Upper leaf surface* green, with indumentum absent or very sparse, 1 or 2 prickles present on midrib; stellate hairs 1.5–4.0 mm apart, 0.25–0.35 mm across, sessile, with 8–16 porrect lateral rays, the central ray 0.5–0.9 times as long as laterals. *Lower leaf surface* green to grey-green, with very sparse to dense indumentum; prickles absent or 1 or 2 present on midrib only; stellate hairs 0.2–0.6 mm apart, 0.3–0.45 mm diam., sessile, with 11–16 porrect lateral rays, the central ray 0.2–1.2 times as long as laterals. *Inflorescence* 4–7-flowered, with common peduncle 0–9 mm long, rachis prickles present or absent. *Pedicels* at anthesis 7–16 mm long, prickles present or absent. *Calyx* indumentum dense at base of tube, gradually becoming sparser towards lobe tips; tube at anthesis 2.0–2.5 mm long; lobes 2.0–3.0 mm long, purple; prickles absent; stellate hairs yellow or purple, 0.1–0.2 mm across, sessile, with 6–16 lateral rays, the central ray 0.4–1 times as long as laterals. *Corolla* purple to mauve, 13–16 mm long, inner surface glabrous. *Stamens* with anthers 5.8–6.1 mm long; filaments papillose, 1.6–2.2 mm long. *Ovary* with small glandular hairs only; functional style 9–10 mm long, with glandular hairs only. *Mature fruits* 1 per inflorescence, diam. unknown. *Fruiting pedicels c.* 8 mm long. *Seeds* 3.5–3.7 mm long. (Figure 12)

Other specimen examined. WESTERN AUSTRALIA [locality withheld for conservation reasons]: 12 Aug. 1986, *R.J. Cranfield* 5639 (CANB, PERTH).

Distribution and habitat. Known only from Mount Padbury station, *c.* 120 km north-north-west of Meekatharra in Western Australia (Figure 11). It grows in 'open scrub' on red or brown clayey sand.

Phenology. Flowers are recorded for August; fruiting time unknown.

Conservation status. To be listed as Priority One under DEC Conservation Codes for Western Australian Flora (M. Smith pers. comm.).

Etymology. The epithet is from the Greek word *iodes* meaning 'violet-like'. This refers to the calyx lobes that are a rich violet colour in this species.

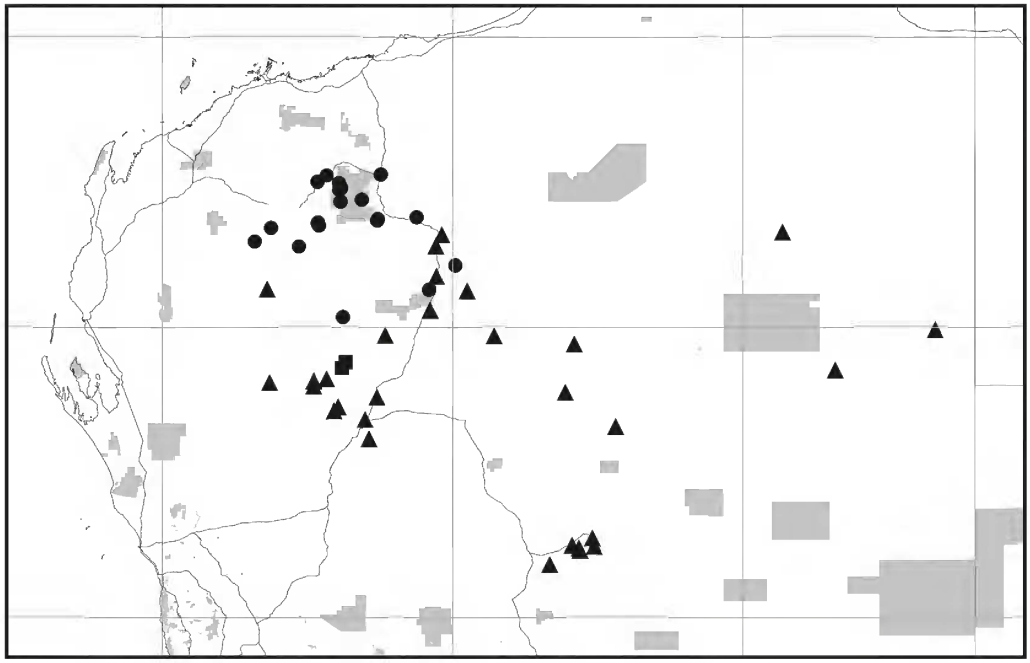

Figure 11. Distribution of *Solanum austropiceum* (▲), *S. iodinum* (■) and *S. piceum* (●).

Affinities. Related to *S. piceum*, but differing by the longer central ray of the stellate hairs on the upper and lower leaf surfaces and on the calyx, the mostly longer pedicels, the smaller stellate hairs on the calyx, the very sparse indumentum on the calyx lobes which are a rich violet colour, and the smaller seeds.

7. Solanum piceum A.R.Bean, *sp. nov.*

Affinis *S. morrisonii* Domin sed numero majore aculeorum in ramulis, praesentia aculeorum in lamina foliorum, pilis stellatis in paginis omnibus foliorum calycisque, pilis stellatis calycis radio centrali praeditis differens.

Typus: Hamersley Station, 2 miles [3 km] east of 150 mile camp on the Mt Tom Price iron ore railway, Western Australia, 28 January 1976, *M.E. Trudgen* 1615 (*holo*: BRI AQ875923; *iso*: CANB, *distribuendi*, PERTH 06093388).

Erect *shrub* 0.6–1.5 m high. *Juvenile leaves* unknown. *Adult branchlets* white, brown or grey, with a very dense indumentum; prickles present, 6–27 per 0.1 m of stem, straight, acicular, 2–6 mm long, 6–18 times longer than wide, glabrous; stellate hairs 0.25–0.4 mm diam., sessile, with 10–15 porrect lateral rays, the central ray 0–0.7 times as long as laterals. *Adult leaves* linear, lanceolate or elliptical, entire or shallowly lobed, lobes 1–3 on both sides, lobing index 1–1.1; lamina 1.0–7.0 cm long, 0.3–1.9 cm wide, 3.2–11.8 times longer than broad, apex obtuse or acute, base cuneate or rarely hastate; oblique part 0–1 mm long, obliqueness index 0–4%; petiole 0.2–1.4 cm long, 12–21% length of lamina, prickles absent or present. *Upper leaf surface* green, with an absent or very sparse indumentum; prickles 1–5 on midrib; stellate hairs 0.5–3.0 mm apart, 0.25–0.35 mm across, sessile, with 10–16 porrect lateral

Figure 12. Holotype of *Solanum iodinum* (*R.J. Cranfield* 5709).

rays, the central ray 0–0.4 times as long as laterals. *Lower leaf surface* green to grey-green, with a very sparse to moderately dense indumentum; prickles 1–15 on midrib only, or on midrib and secondary veins; stellate hairs 0.15–0.8 mm apart, 0.25–0.4 mm diam., sessile, with 10–16 porrect lateral rays, the central ray 0–0.4 times as long as laterals. *Inflorescence* 2–8-flowered, with common peduncle 0–6 mm long, rachis prickles absent. *Pedicels* at anthesis 4–10 mm long, prickles present or absent. *Calyx* with a dense to very dense indumentum; tube at anthesis 1.5–2.5 mm long; lobes 0.5–2.5 mm long; prickles present or absent; stellate hairs yellow or white, 0.2–0.3 mm across, with a stalk 0–0.1 mm long and 11–16 lateral rays, the central ray 0.2–0.5 times as long as laterals. *Corolla* purple, 9–14 mm long, inner surface glabrous or with a cluster of simple hairs at the lobe apices. *Stamens* with anthers 4.7–6.4 mm long; filaments papillose, 1.5–2.0 mm long. *Ovary* with small glandular hairs only, or with small glandular hairs and stellate hairs; functional style 8–9.5 mm long, with glandular hairs only, or with short glandular hairs and stellate hairs. *Mature fruits* 1–6 per inflorescence, 13–16 mm diam., black, shiny. *Fruiting pedicels* 6–12 mm long. *Seeds* 3.8–4.5 mm long. (Figures 1A, 13)

Selected specimens examined. WESTERN AUSTRALIA: Ilgarari Station, holding paddock, 27 May 1996, *Anon.* 6/96 (PERTH); Paraburdoo, 5 May 1978, *K.J. Atkins* 236 (PERTH); near Mt Stevenson, Hamersley Range, 13 June 1966, *J.V. Blockley* 275 (PERTH); eastern Hamersley Range, 6 Sep. 1995, *N.E. Casson & E.M. Mattiske* MCPL 1022 (PERTH); 33.9 km N of Pretty Pool, Wanna Station, 24 June 2005, *D.J. Edinger* 5089 (PERTH); bed of Hardie River, Hamersley Range, 26 Aug. 1932, *C.A. Gardner* 4175 (PERTH); West Angelas, 24 Dec. 1975, *S. Janicke* U 16 (PERTH); south side of Paraburdoo Mine dump, 14 June 1977, *A.A. Mitchell* 384 (PERTH); 30 km W of Mininer Station HS, 21 July 1977, *A.A. Mitchell* 391 (BRI, PERTH); 40 km N of Mininer Station HS, 26 June 1977, *A.A. Mitchell* 404 (PERTH); Woodlands Station, 24 Mar. 1982, *A.A. Mitchell* 956 (PERTH); *c.* 17 km SE of Hamersley Station HS, 3 June 1994, *A.A. Mitchell* 3605 (BRI, PERTH); 24.6 km from Hamersley Station HS on a bearing of 186 degrees, and about 1.5 km S of Francis Bore near Wittenoom, 19 May 1996, *A.A. Mitchell* PRP 1114 (PERTH); 12 km from Weelarrana HS on a bearing of 26 degrees, near Newman, 19 June 1996, *A.A. Mitchell* PRP 1150 (PERTH); *c.* 23 km E of Ashburton Downs Station HS, 1 km S of the Ashburton Downs–Kooline River road, *c.* 100 km SW of Paraburdoo, 12 May 1997, *A.A. Mitchell* 4727 (PERTH); 4.0 km SW of West Angelas camp, 29.5 km due S of Packsaddle Camp, 13 Feb. 1987, *F.H. Mollemans* 2259 (PERTH); 14 km N of Juna Downs HS, Hamersley Range, 9 Aug. 1973, *M.E. Trudgen* 378 (BRI, PERTH); Hamersley Range N.P., 8.4 km W of Marandoo springs on 'new' Mt Tom Price road, 8 May 1977, *M.E. Trudgen* 1838 (PERTH); Hamersley Range N.P., 5.7 miles [9.2 km] from Milli-Milli springs on the track to Coppin Pools, 7 May 1980, *M.E. Trudgen* 2422 (BRI, PERTH); Tom Price–Karijini road, 34.5 km E of Tom Price, 24 July 2004, *J.E. Wajon* 1111 (PERTH).

Distribution and habitat. Solanum piceum occurs in the Pilbara and Gascoyne bioregions of Western Australia, near the towns of Tom Price, Paraburdoo and Newman (Figure 11). It grows on creek banks and creek flats, in communities dominated by *Acacia aneura* or *A. sibirica* with an understorey of spinifex or tussock grassland, on fine red to brown loam.

Phenology. Flowers are recorded from December to August; fruits are recorded for January, May and August.

Conservation status. A common species with a wide distribution, including occurrences in national parks.

Etymology. From the Latin *piceus* meaning 'pitch-black' or 'of pitch'. This is in reference to the black mature fruits.

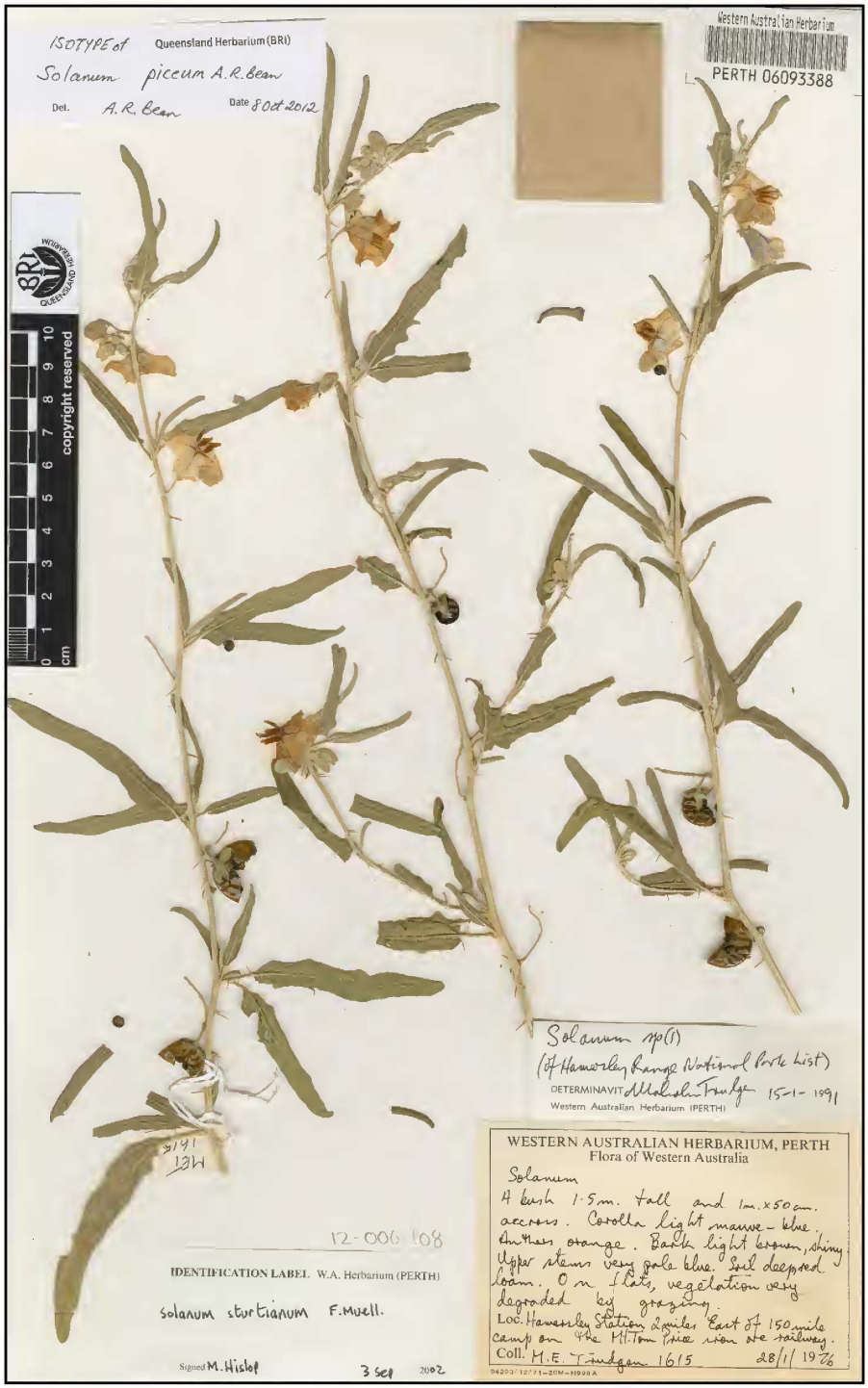

Figure 13. Isotype of *Solanum piceum* (*M.E. Trudgen* 1615).

Affinities. Related to *S. morrisonii*, but differing by the 6–25 branchlet prickles per 0.1 m of stem (0–5 for *S. morrisonii*), the presence of prickles on the leaf laminae, the larger stellate hairs on the upper and lower leaf surfaces and the calyx, and the calyx stellate hairs having a central ray 0.2–0.5 times as long as the laterals (absent for *S. morrisonii*).

8. Solanum sturtianum F.Muell., *Trans. Philos. Soc. Victoria* 1: 19 (1854). *Hooker's J. Bot. Kew Gard. Misc.* 8: 166 (1856). *Type*: 'interior of South Australia', 1844 or 1845, *C.N. Sturt* 87 (*lecto*: MEL 11651), *fide* A.R. Bean, *Austrobaileya* 6: 792 (2004).

Illustrations. G.M. Cunningham, W.E. Mulham, P.L. Milthorpe & J.H. Leigh, *Pl. Western N.S.W.* 589 (1981); R. McKenzie, *Austr. Poisonous Pl., Fungi & Cyanobacteria* 556–7 (2012).

Erect *shrub* 0.3–1.2 m high. *Juvenile leaves* entire. *Adult branchlets* white or grey, with a very dense indumentum; prickles absent or present, 0–10 per 0.1 m of stem, straight, broad-based, 2–8 mm long, 4–8 times longer than wide, glabrous or with scattered stellate hairs on lower half; stellate hairs 0.3–0.5 mm diam., sessile, with 12–16 porrect lateral rays, the central ray absent. *Adult leaves* narrow-lanceolate or lanceolate, entire; lamina 3.7–9.8 cm long, 1.0–1.8 cm wide, 3.1–5.7 times longer than broad, apex obtuse or acute, base cuneate, cordate or obtuse; oblique part 0–5 mm long, obliqueness index 0–6%; petiole 0.6–1.3 cm long, 15–27% length of lamina, prickles absent or present. *Upper leaf surface* grey-green to grey, with a moderately dense to very dense indumentum; prickles absent; stellate hairs 0.1–0.2 mm apart, 0.15–0.3 mm across, sessile, with 12–15 porrect lateral rays, the central ray absent. *Lower leaf surface* white, grey or silvery, with a very dense indumentum; prickles absent; stellate hairs 0.03–0.07 mm apart, 0.2–0.3 mm diam., sessile, with 12–16 porrect lateral rays, the central ray absent. *Inflorescence* 5–10-flowered, with common peduncle 2–6 mm long, rachis prickles absent. *Pedicels* at anthesis 4–9 mm long, prickles absent. *Calyx* with a very dense indumentum; tube at anthesis 1.5–3.5 mm long; lobes 1.5–2.5 mm long; prickles absent; stellate hairs yellow or white, 0.15–0.25 mm across, sessile, with 12–15 lateral rays, the central ray absent. *Corolla* mauve to purple, 10–15 mm long, inner surface with a cluster of simple or branched hairs at apex of each lobe. *Stamens* with anthers 4.5–6.5 mm long; filaments papillose, 1.5–1.9 mm long. *Ovary* with short glandular hairs; functional style 7–10 mm long, with short glandular hairs. *Mature fruits* 1–3 per inflorescence, 9–12 mm diam. *Fruiting pedicels* 7–12 mm long. *Seeds* 3.8–5.1 mm long. (Figures 6D, 14)

Selected specimens examined. WESTERN AUSTRALIA: 5 km W of Gill Pinnacle turnoff on the road to Warakurna near the Schwerin Mural Crescent sign, 23 June 2007, *L.S. Sweedman* 7114 (PERTH). NORTHERN TERRITORY: 4 miles E of Dead Bullock Dam, Tempe Downs, 23 Nov. 1954, *G. Chippendale* 568 (BRI); 42 miles SW of Ooratippra HS, Central Australia, 12 July 1957, *G. Chippendale* 3534 (BRI); 3 miles W of Stuart Hwy, 3 miles S of Finke River crossing, 13 July 1963, *A.S. George* 5020 (PERTH); 23 miles [37 km] SSE of Alice Springs township, 17 Aug. 1956, *M. Lazarides* 5728 (BRI). SOUTH AUSTRALIA: Moonaree Station, 5 km W of Moonaree HS, 29 May 1992, *F.J. Badman* 5256 (BRI); between Blinman and Wirrealpa Station, 27 Oct. 1955, *R. Hill* 375 (BRI); Willow Springs Station, 15 July 2000, *K.R. McDonald* KRM 517 (BRI). QUEENSLAND: 17.9 km from 'Plevna Downs' HS, towards Eromanga, 29 Aug. 2010, *A.R. Bean* 30118 (BRI, CANB, NY); 32.2 km along Coonenberry Creek road, WSW of Eromanga, 31 Aug. 2010, *A.R. Bean* 30184 (BRI); *c.* 13 km due S of Thargomindah, on road to Hungerford, 27 Sep. 2002, *A.B. Pollock* ABP 1359 *& R.J. Price* (BRI); Grey Range, *c.* 74 km from Thargomindah on road to Noccundra, 20 July 1977, *R.W. Purdie* 735 (BRI). NEW SOUTH WALES: 78.1 km from 'Olive Downs' HS via Jump Up Loop Rd, on Gorge Loop Rd, ENE of Tibooburra, 6 Sep. 1989, *R.G. Coveny* 13583 *et al.* (BRI); 18.6 km SW of Broken Hill on the Barrier Hwy, 26 Aug. 2010, *R.A. McKenzie* RAM 10/112 (BRI);

Figure 14. Representative specimen of *Solanum sturtianum* (*A.R. Bean* 30118).

tributary of Dense Camp Creek, Mundi Mundi Range, 14 Jan. 2000, *P.G. Wilson* 1481 (BRI, CANB). VICTORIA: Wargan, Walker Rd, 1 km W of intersection with Meridian Rd, 1 Dec. 2011, *V. Stajsic* 6000 & *D.E. Albrecht* (BRI).

Distribution and habitat. *Solanum sturtianum* occurs in the arid parts of Queensland, New South Wales, South Australia and the Northern Territory, and also extends just into Western Australia and Victoria (Figure 15). It occurs on slopes or drainage lines in undulating terrain on red, stony or gravelly loams, often in association with *Acacia aneura*, *A. cambagei* or *A. sibirica* and various shrubs, or in chenopod shrubland.

Phenology. Flowers and fruits have been recorded for every month except December.

Conservation status. A common species with a wide distribution, including occurrences in national parks.

Etymology. Named for Charles Napier Sturt (1795–1869), famous Australian explorer and surveyor.

Common name. Thargomindah nightshade.

Affinities. *Solanum sturtianum*, *S. morrisonii* and *S. elatius* have small foliar stellate hairs in which the central ray is lacking, and none of these species has prickles on the leaf lamina. *Solanum sturtianum* is also closely related to *S. austropiceum*, but differs from the latter by the broad-based prickles, the smaller stellate hairs without a central ray, the lack of prickles on the leaf lamina, and the ovary with small glandular hairs.

Notes. *Solanum sturtianum* has recently been recorded from Victoria for the first time, very close to the New South Wales border. The most westerly occurrence of *S. sturtianum* is represented by *L.S.J. Sweedman* 7114 (PERTH), from Gill Pinnacle in eastern Western Australia; this specimen is atypical in that at least three of the inflorescences are 2-branched.

9. Solanum morrisonii Domin, *Biblioth. Bot.* 89: 577 (1929). *Solanum tetrandrum* var. *angustifolium* A.Morrison, *J. Bot.* 50: 275 (1912). *Type citation*: 'Ashburton River, October'. *Type*: between Globe Hill and Minderoo, Ashburton River, Western Australia, 7 October 1905, *A. Morrison s.n.* (*lecto*, here designated: BM 0008468332; *isolecto*: BM 000846790, E 00279463, PERTH 03699226).

Erect *shrub* 0.3–1.0 m high. *Juvenile leaves* entire. *Adult branchlets* white, grey or brown, with a very dense indumentum; prickles absent or present, 0–5(–22) per 0.1 m of stem, straight, broad-based, 1–6.5 mm long, 4–8 times longer than wide, glabrous or with scattered stellate hairs on lower half; stellate hairs 0.2–0.3 mm diam., sessile, with 11–16 porrect lateral rays, the central ray absent. *Adult leaves* lanceolate to linear, entire; lamina 3.6–9.4 cm long, 0.4–1.1 cm wide, 6.4–14 times longer than broad, apex acute or obtuse, base cuneate; oblique part 0–5 mm long, obliqueness index 0–9%; petiole 0.4–1.5 cm long, 9–22% length of lamina, prickles absent. *Upper leaf surface* green, with a very sparse to moderately dense indumentum; prickles absent; stellate hairs 0.15–0.5 mm apart, 0.1–0.2 mm across, sessile, with 11–16 porrect lateral rays, the central ray absent. *Lower leaf surface* grey-green, with a sparse to dense indumentum; prickles absent; stellate hairs 0.15–0.3 mm apart, 0.15–0.2 mm diam., sessile, with 11–16 porrect lateral rays, the central ray absent. *Inflorescence* 5–10-flowered, with common peduncle 0–5 mm long, rachis prickles absent. *Pedicels* at anthesis 8–13 mm long, prickles absent. *Calyx* with a moderately dense to very dense indumentum; tube at anthesis 1.5–2.5 mm long; lobes 1–2.5 mm long; prickles absent; stellate hairs yellow or white, 0.1–0.25 mm across, sessile, with

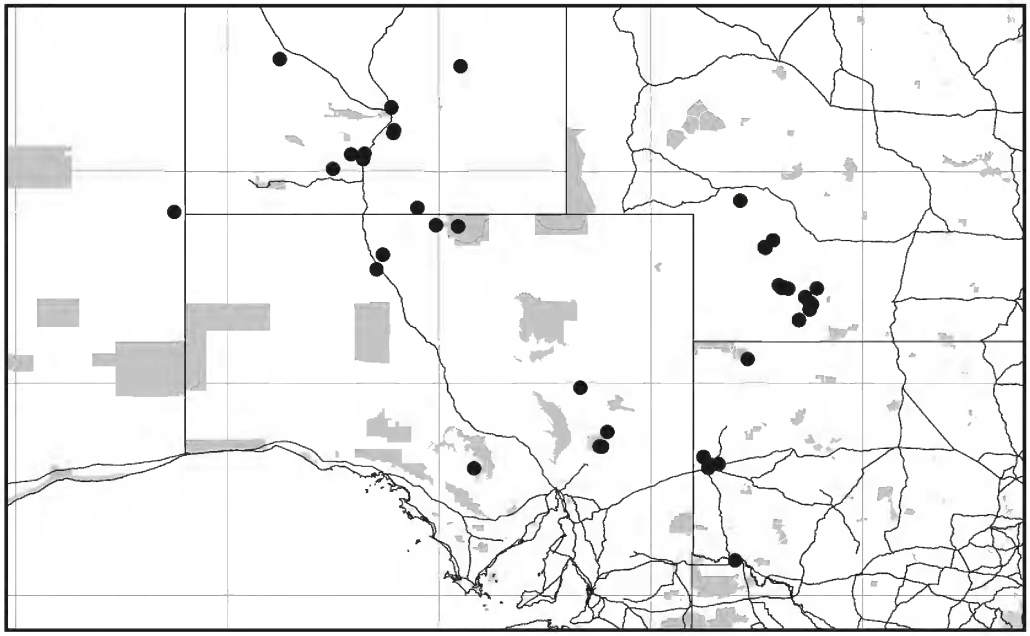

Figure 15. Distribution of *Solanum sturtianum*.

11–16 lateral rays, the central ray absent. *Corolla* purple, 9–18 mm long, inner surface usually with a cluster of branched or simple hairs at the apex of each lobe. *Stamens* with anthers 4.8–7.1 mm long; filaments lacunose or smooth, 0.7–1.7 mm long. *Ovary* with short glandular hairs; functional style 9–10.5 mm long, with short glandular hairs on proximal half. *Mature fruits* 1–5 per inflorescence, 11–15 mm diam. *Fruiting pedicels* 10–16 mm long. *Seeds* 3.8–5.7 mm long. (Figures 6E, 16)

Selected specimens examined. WESTERN AUSTRALIA: 68 miles S of Onslow, 28 May 1962, *T.E. Aplin* 1602 (PERTH); Fortescue Marsh, beside Port Hedland–Newman railroad, 10 May 2006, *A.R. Bean* 25435 (B, BM, BRI, MEL, NY, PERTH); Fortescue Marsh, beside Port Hedland–Newman railroad, 10 May 2006, *A.R. Bean* 25437 (BRI, L, NSW, PERTH); 48 miles [77 km] W of Roy Hill on Wittenoon road, 12 Aug. 1965, *A.C. Beauglehole* ACB 11425 (CANB, PERTH); track behind station to Yanarrie River, within 200 m of homestead, Yanrey Station, 6 May 2004, *G. Byrne* 942 (PERTH); 53 km S of Onslow on Onslow–Carnarvon road, 28 May 1962, *J.R. Cannon* JRC 620515 (PERTH); Minilya River, 27 Aug. 1932, *C.A. Gardner* 3179 (PERTH); near Fortescue River, 14.8 km S of Hesta Siding, 10 May 2006, *B.J. Lepschi* 6001 *& L.A. Craven* (BRI, CANB; AD, DNA, K, L, MEL, MO, NSW, NY, PERTH, to be distributed); *c.* 100 km N of Newman and 20 km W of Great Northern Hwy, 8 May 1996, *A.A. Mitchell* PRP 1017 (PERTH); 28.8 km from Marillana HS on a bearing of 305 degrees, 10 May 1996, *A.A. Mitchell* PRP 1032 (PERTH); near Bob's Bore, 14.1 km from Yarraloola HS on a bearing of 251 degrees, 6 Nov. 1996, *A.A. Mitchell* PRP 1717 (PERTH); *c.* 8 km N of Kooline Bore, Kooline Station, *c.* 140 km SW of Paraburdoo, 13 May 1997, *A.A. Mitchell* 4729 (PERTH); *c.* 20 km E of Wanutarra Station HS, *c.* 220 km W of Paraburdoo, 15 May 1997, *A.A. Mitchell* 4736 (BRI, PERTH); 11 km N of Mt George, *c.* 36 km E of Wittenoom, 28 Mar. 1984, *K. Newbey* 10027 (PERTH); 18 km NE of Mt Marsh, *c.* 95 km E of Wittenoom, 28 June 1984, *K. Newbey* 10220 (PERTH); 107 km E of Wittenoom, 22 July 1976, *C.I. Stacey* CIS 505 (PERTH); Nanutarra Station, W.A. resource monitoring site No. 2, 7 Aug. 1986, *J. Stretch s.n.* (PERTH).

Distribution and habitat. *Solanum morrisonii* is found in the Pilbara and Carnarvon bioregions of Western Australia, south of 21.5 degrees latitude (Figure 7). It grows on floodplains, clay plains, flats or depressions. Soil is often clayey, but may also be orangy red to red-brown loam or clay loam, sometimes salt-encrusted. It may be associated with *Acacia victoriae* or other *Acacia* spp., and various grasses (including *Triodia* spp.), and succulent species of the family Chenopodiaceae, such as *Atriplex amnicola*.

Phenology. Flowers are recorded from March to August; fruits have been recorded from May to September.

Conservation status. A common species with a wide distribution, including occurrences in national parks.

Etymology. Named for the collector of the type, Alexander Morrison (1849–1913).

Affinities. *Solanum morrisonii* has a similar distribution to *S. elatius*, and the two are clearly closely related. *Solanum morrisonii* differs from *S. elatius* by its smaller stature, lack of prickles, sparse foliar indumentum (especially the upper surface), presence of small glandular hairs on the lower part of the style and on the ovary (glabrous for *S. elatius*) and entire juvenile leaves. *Solanum morrisonii* grows on floodplains, clay plains or depressions, while *S. elatius* prefers red sand plains.

10. Solanum elatius A.R.Bean, *sp. nov.*

Affinis *S. morrisonii* Domin sed altitudine sua majore, foliorum paginis canis vel argenteis indumento pilorum stellatorum denso usque densissimo praeditis, pagina interiore corollae glabra, ovario styloque glabro et foliis juvenilibus conspicue lobis differens.

Typus: Karijini National Park, 17 km along Karijini Drive from ranger station, Western Australia, 16 September 2006, *D. Halford* Q 9193 (*holo*: BRI AQ742632; *iso*: BM, NY, PERTH 07800940).

Erect *shrub* 0.6–2.5(–3.0) m high. *Juvenile leaves* with 1–3 conspicuous basal lobes. *Adult branchlets* white to silvery, with a very dense indumentum; prickles absent or present, 0–8 per 0.1 m of stem, straight or curved, broad-based, 2.5–8 mm long, 4–7 times longer than wide, glabrous or with scattered stellate hairs on lower half; stellate hairs 0.15–0.3 mm diam., sessile, with 11–16 porrect lateral rays, the central ray absent. *Adult leaves* narrow lanceolate to linear, entire; lamina 4.0–9.2 cm long, 0.45–1.2 cm wide, 5.7–16 times longer than broad, apex acute or obtuse, base cuneate; oblique part 0–3 mm long, obliqueness index 0–5%; petiole 0.6–1.4 cm long, 9–20% length of lamina, prickles absent. *Upper leaf surface* silvery, with dense to very dense indumentum; prickles absent; stellate hairs 0.05–0.1 mm apart, 0.1–0.25 mm across, sessile, with 11–16 porrect lateral rays, the central ray absent. *Lower leaf surface* silvery, with dense to very dense indumentum; prickles absent; stellate hairs 0.05–0.15 mm apart, 0.1–0.25 mm diam., sessile, with 11–16 porrect lateral rays, the central ray absent. *Inflorescence* 6–17-flowered, with common peduncle 1–12 mm long, rachis prickles absent. *Pedicels* at anthesis 6–12 mm long, prickles absent. *Calyx* with a very dense indumentum; tube at anthesis 2–4 mm long; lobes deltate, 1–2 mm long; prickles absent; stellate hairs pale yellow or white, 0.15–0.25 mm across, sessile, with 12–16 lateral rays, the central ray absent. *Corolla* purple, 11–20 mm long, inner surface usually without any hairs at the apex of each lobe. *Stamens* with anthers 5.3–6.9 mm long; filaments lacunose or smooth, 1–1.5 mm long. *Ovary* glabrous; functional style 10–11 mm long, glabrous. *Mature fruits* 1–6 per inflorescence, 11–14 mm diam. *Fruiting pedicels* 9–14 mm long. *Seeds* 4.0–5.2 mm long. (Figures 1B, 1D, 2B, 6F, 17)

Figure 16. Representative specimen of *Solanum morrisonii* (*A.R. Bean* 25435).

Figure 17. Holotype of *Solanum elatius* (*D. Halford* Q 9193).

Selected specimens examined. WESTERN AUSTRALIA: Tom Price, 23 July 1978, *K.J. Atkins* 313 (PERTH); 54 km from Newman on road to Marble Bar, 1 May 2006, *A.R. Bean* 25243 (BM, BRI); old Highway 1, near 'Ethel Creek', NE of Newman, 5 May 2006, *A.R. Bean* 25314 (BRI, E, W); 8.4 km N of 'Balfour Downs' HS, ENE of Newman, 5 May 2006, *A.R. Bean* 25334 (BRI, NSW, PRE); Nullagine, 73 miles S of Marble Bar, 12 Aug. 1965, *A.C. Beauglehole* 11392 (PERTH); on Tom Price road, *c.* 10 miles S of Hamersley Gorge, 29 Sep. 1969, *M.I. Brooker* 2167 (PERTH); 21 miles N of Minilya River bridge on Carnarvon–Onslow road, 2 June 1966, *J.R. Cannon* JRC 660608 (PERTH); 51 miles S of Barradale, 29 Aug. 1973, *H. Demarz* 4470 (PERTH); Cane River Conservation Park, 23.6 km NNE of Mt Murray, 99.7 km SE of Onslow, 28 June 2011, *S. Dillon & A. Markey* CR 9005 (BRI, PERTH); 7.5 km NW of turnoff to Mount Minnie Station on Onslow road, 19 May 1999, *D.J. Edinger* 1712 (PERTH); 14 miles [23 km] W of Millstream Station, towards Yarraloola Station, Aug. 1967, *C.H. Gittins* 1468 (BRI); junction of track to Brockman mine and powerline service track, *c.* 40 km NNW of Tom Price, 23 Sep. 2006, *D. Halford* Q 9250 (AD, BRI, PERTH); West Angelas, 24 Dec. 1975, *S. Janicke* U 16 (PERTH); *c.* 20 km NW of Mt Bruce, 7 June 1994, *A.A. Mitchell* 3626 (PERTH); *c.* 20 km E of Nullagine on Skull Springs Rd, to Woodie Woodie, 31 Oct. 1995, *A.A. Mitchell* PRP 960 (PERTH); on the Jigalong–Lake Disappointment track, *c.* 20 km E of Jigalong, 26 June 1996, *A.A. Mitchell* PRP 1239 (PERTH); 8 km NE of Quarry Hill, *c.* 120 km W of Tom Price, 4 Aug. 1984, *K. Newbey* 10680 (PERTH); Juna Downs Station, 29 Mar. 1995, *H.J. Pringle* PRP 11 (PERTH); Burkett Road, 6 km W of North West Coastal Hwy, 23 July 2002, *J.E. Wajon* 521 (PERTH); Marindoo Camp, *c.* 1 mile S of Mt Bruce, Hamersley Range N.P., 7–9 Aug. 1973, *A.S. Weston* 8494 (PERTH).

Distribution and habitat. Common throughout much of the Pilbara bioregion and the northern half of the Carnarvon bioregion of Western Australia (Figure 4). It mostly occurs on red-soil sand plains dominated by spinifex (*Triodia* spp.) or rocky areas with shallow sandy to loamy soil. Frequently associated species include Mulga and various other *Acacia* spp., also *Senna* spp. and *Ptilotus nobilis*.

Phenology. Flowers are recorded from March to November; fruits are recorded from May to November.

Conservation status. A common species with a wide distribution, including occurrences in national parks.

Etymology. From the Latin *elatior*, meaning 'taller'. *Solanum elatius* is considerably taller than any other arid-zone *Solanum* species in Australia.

Affinities. Solanum elatius is most closely related to *S. morrisonii*, but it differs from the latter by its usually taller stature, the grey or silvery leaf surfaces with a dense to very dense cover of stellate hairs, the inner surface of the corolla glabrous, the glabrous ovary and style, and the conspicuously lobed juvenile leaves. The two species occupy different habitats, with *S. elatius* preferring red sand plains and *S. morrisonii* growing on floodplains, clay plains or depressions.

Notes. The label for *Mitchell* PRP 1239 states that the species is 'up to 3 m tall', and several other labels indicate heights nearly as great e.g. 2.5 m, 8 feet.

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